Privateer Farm
Addendum to the NCDOT UMBI
May 2009

A. Site History

The Privateer Farm stream and wetlands restoration site (the Site) is located in United States Geological Survey (USGS) Hydrologic Unit (HU) 03030005 and North Carolina Division of Water Quality (NCDWQ) Cape Fear River sub-basins 15 and 16 along Little Alligator Swamp and Harrison Creek. The Site is located in the Southeastern Plains Level III Ecoregion (Southeastern Floodplains and Low terraces Level IV Ecoregion) and includes portions of Cumberland and Bladen Counties, approximately 6 miles from the southern boundary of CU 03030004 (see Figure 1). The surrounding area includes hundreds of elliptical shaped wetlands, called Carolina Bays, and is listed by the National Audubon Society as an Important Bird Area (IBA) for its unique habitats.

The Site encompasses a 430-acre boundary contained within the 4,600 acre farm property. The property owners, Ms. Sharon Valentine and Mr. Marvin Johnson, intend to restore the entire property to its historic wetland ecosystem. The restoration project involving historic Harrison Creek is the first step toward this goal and is the centerpiece of the restoration effort (see Figure 2).

The North Carolina Department of Transportation (NCDOT) holds a conservation easement over the Site; the easement was signed December 24th, 2003. A minor correction was made to the document's notary page and the corrected easement was signed July 7th, 2005. Both copies are available at: http://www.ncdot.org/doh/preconstruct/pe/neu/Monitoring/default.html.

The remainder of the farm property to be restored has entered into the Natural Resources Conservation Services (NRCS) Wetlands Reserve Program. Currently the easement has been obtained by NRCS. NRCS is planning to complete the engineering design in-house, which will most likely consist of ditch plugs, with review and comments provided by Baker Engineering. NRCS is fully aware of the NCDOT easement and mitigation credit and are committed in preserving the integrity of the NCDOT project.

Prior to restoration, stream and riparian functions on the Site had been severely impacted as a result of agricultural conversion. Harrison Creek was channelized in the early 1980s to reduce flooding and provide a drainage outlet for the extensive ditching across the Site. As a result, the stream existed as a very large canal through the project site. Backwater conditions were imposed along extensive sections of the stream due to culverts and debris blockages, and natural riffle and pool sequences were nearly non-existent. Harrison Creek is classified as Class C waters, which are suitable for aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture.

B. Project Goals

The goal of the project is to restore functional stream and wetland systems to the Site. The stream system that historically flowed through the Site was channelized and, as a result, was highly incised ("Gc" type stream – Rosgen classification) prior to restoration. The natural channel design for the restored stream involved the construction of a new, meandering channel across the agricultural fields. The furthest upstream portion of the project used sections of the remnant historic channel for Harrison Creek that were still visible within the existing wetland areas. The remaining portion of the restored channel was constructed as a Rosgen "C" stream type with design dimensions based on historic reference parameters for Harrison Creek. These reference parameters were determined from historic aerial photographs (see Figure 3), the topography of the valley, and local reference reach information. The total stream length across the Site was increased from approximately 25,000 LF to 34,000 LF. Restoration activities for the Site involved moving the stream channel back to its historic location and elevation, and filling drainage ditches to raise the local water table and restore wetland and stream hydrology. The plan also included scarification of the fields and breaking of the local plow pan to increase surface water storage and provide a range of hydrologic conditions suitable for a variety of native wetland plant species.

The following excerpt from the original mitigation plan, titled Privateer Farm Restoration Plan, July 2004, completed by Buck Engineering, details the performance standards for the Site:

Wetland Hydrologic Monitoring

Success Criteria: To meet the hydrologic success criteria, the monitoring data must show that for each normal year within the monitoring period, the Site has been inundated or saturated within 12 inches of the soil surface for a minimum of 12.5% of the growing season (30 consecutive days). This targeted hydroperiod is based on hydrologic model analyses of the Site, as presented in Section 3.6. WETS tables for Cumberland County will be utilized to determine normal precipitation. If the restored Site is inundated or saturated within 12 inches of the soil surface for less than 12.5% of the growing season, but the post-restoration monitoring data reflect that the Site meets applicable USACE criteria for wetlands and the Site is performing with similar hydrology as a monitored reference site, then the regulatory agencies may consider the Site for mitigation of in-kind impacts on a case-by-case basis.

Vegetation Monitoring

Success Criteria: Success will be defined as 320 stems per acre after five years. When rooted vegetation does not survive, a determination will be made as to the need for replacement; in general, if greater than 25% die, replacement will be done.

Stream Monitoring

Bankfull Events

Success Criteria: Data collected from the stream gages should indicate that bankfull events are occurring on a natural cycle, as compared to return intervals documented by Sweet and Geratz (2003). At least two bankfull events should be documented within the five year monitoring period.

Cross-sections

Success Criteria: There should be little or no change in as-built cross-sections. If changes do take place they should be evaluated to determine if they represent a movement toward a more unstable condition (e.g., down-cutting, erosion) or are minor changes that represent an increase in stability (e.g., settling, vegetative changes, deposition along the banks, decrease in width-to-depth ratio and/or cross sectional area).

Longitudinal Profile

Success Criteria: The longitudinal profiles should show that the bedform features are remaining stable, i.e. they are not aggrading or degrading. The pools should remain deep with flat water surface slopes and the riffles should remain steeper and shallower.

Photo Reference Sites

Success Criteria: Photographs will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal photos should indicate the absences of developing bars within the channel or an excessive increase in channel depth.

Lateral photos should not indicate excessive erosion or continuing degradation of the bank over time. A series of photos over time should indicate successional maturation of riparian vegetation. Vegetative succession should include initial herbaceous growth, followed by increasing densities of woody vegetation, and then ultimately a mature overstory with herbaceous understory.

C. Site Construction

While restoration of the stream channel followed the historic pattern of Harrison Creek, the restored stream would most appropriately be considered a tributary to Harrison Creek. Flow from the headwaters of Harrison Creek was channelized around the perimeter of the farm as part of the conversion of the Site to agricultural land. Due to elevation differences

between the restored stream and the channelized stream around the perimeter of the farm, flow from the headwaters of Harrison Creek could not be diverted into the restoration channel without causing significant hydrologic trespass issues beyond the property boundary of Privateer Farm. Therefore, the restored channel was designed to function as a headwater to Harrison Creek, with a drainage area of approximately one square mile, increasing to a drainage area of six square miles at the downstream end of the project (Figure 2).

Due to the extensive length of stream restoration and changes in drainage area from the beginning to the end of the project, the project was divided into five stream reaches. Design ratios were the same for each design reach and were based on reference reach information. The size of each restored channel reach increased from upstream to downstream to reflect the increasing drainage area.

The channel design allows discharges greater than bankfull flows to spread onto the floodplain, dissipating flow energies and reducing stress on streambanks. In-stream structures were used to control streambed grade, reduce stress on streambanks, and promote bedform sequences and habitat diversity. The in-stream structures consisted of root-wads, log vanes, and log weirs that promote a diversity of habitat features in the restored channel. Streambanks were stabilized using a combination of erosion control matting, bare-root planting, and transplants. Transplants provided immediate shading to the restored stream, as well as living root mass to increase streambank stability and create holding areas for fish and other aquatic biota.

The new stream channel was constructed “in the dry” and all stabilization practices were in place prior to routing stream water into the new sections of channel. When construction of a new reach was completed, plugs were installed in the old channel to re-direct the water into the new channel. After the water had been diverted, the process of filling the old channel with soil began.

The large road that ran from north to south through the middle of the project area was graded to floodplain level in order to fill the road-side canals, and to allow flood flows to spread over the restored floodplain. The north-south road was completely removed within the limits of the project. Two roads that cross the project area from east to west were left in place and to allow for access across the Site to other parts of the farm.

The as-built data collected after construction documented that the total area of restored riverine wetlands was 402.5 acres (excluding 2.5 acres for road accesses), with 25 acres of enhanced riverine wetlands, and 34,005 LF of restored stream channel. Construction of this project was completed in April 2005.

Bare root trees were planted within all areas of the conservation easement. A minimum 50-foot buffer was established along all restored stream reaches. In most areas, the final buffer area was more than several hundred feet wide and included restored wetland areas. In general, bare-root vegetation was planted at a target density of 680 stems per acre, or

an 8-foot by 8-foot grid. Planting of bare-root trees was conducted during the dormant season, with all trees installed prior to March 20, 2005.

Observations were made during construction of the Site regarding the relative wetness of areas to be planted. Planting zones were determined based on these assessments, and planted species were matched according to their wetness tolerance and the anticipated wetness of the planting area. Species planted are summarized in Table 1.

Table 1
Bare-root Tree Species Planted Across the Privateer Farm Restoration Site.

Common Name	Scientific Name	Percent Planted by Species	Total Number of Stems	Wetness Tolerance [1]
Willow oak	*Quercus phellos*	8.6%	23,300	weak – moderate
Swamp chestnut	*Quercus michauxii*	8.6%	23,300	weak
Laurel oak	*Quercus laurifolia*	6.0%	16,200	moderate – weak
Overcup oak	*Quercus lyrata*	6.3%	17,000	moderate
Swamp tupelo	*Nyssa biflora*	7.9%	21,300	tolerant
Water tupelo	*Nyssa aquatica*	8.2%	22,000	tolerant
Bald cypress	*Taxodium distichum*	11.6%	31,200	tolerant
Water oak	*Quercus nigra*	8.6%	23,300	weak – moderate
Sycamore	*Platanus occidentalis*	10.8%	29,200	moderate
Green ash	*Fraxinus pennsylvanica*	10.8%	29,200	moderate
Shumard oak	*Quercus shumardii*	6.5%	17,500	weak
Cherrybark oak	*Quercus pagoda*	5.9%	15,900	weak –intolerant

Notes:
1. Based on information from US Army Corps of Engineers (USACE) Wetland Research Program (WRP) Technical Note VN-RS-4.1 (1997).

D. Current Status

The project has completed its fourth year of annual monitoring. Data for Year 4 monitoring was collected during the fall of 2008, and will include data from 30 hydrologic monitoring stations and 15 vegetation monitoring stations placed throughout the Site, in addition to stream monitoring data, as required by the approved Restoration Plan. Complete monitoring reports for the Privateer Farm site are available at: http://www.ncdot.org/doh/preconstruct/pe/neu/Monitoring/default.html.

E. Community Types

Following construction, the as-built data indicated that the total area of restored riverine wetlands was 402.5 acres (excluding 2.5 acres for road accesses), with 25 acres of enhanced riverine wetlands. The upper portion of the project area to the northern road

crossing (approximately 72 acres) has subsequently been classified as Headwater Forest, as shown in Figure 4. The middle portion of the project area (from the northern road crossing to the southern road crossing the property (approximately 333 acres), has been classified as Bottomland Hardwood Forest. The lower portion of the project area (approximately 25 acres) has been classified as Riverine Swamp Forest.

All three wetland types were evaluated in the summer of 2007 with the North Carolina Wetland Assessment Method (NCWAM) and received an overall score of high quality. The Riverine Swamp and Bottomland Hardwood forests received a low score for the habitat function. These low habitat scores reflect the lack of mature trees and expected strata. However, the habitat scores are expected to improve over time as the vegetation trends toward the expected canopy and diversity.

Based on 2008 vegetation monitoring, twelve of the fifteen vegetation plots are currently meeting the stated success criteria. All of the wetlands on the Site are on a trajectory to meet restoration goals of 260 stems per acre after five years.

Three sections of the restored stream, corresponding to the three wetland evaluation locations, were evaluated using the draft North Carolina Stream Assessment Method (NCSAM) during the summer of 2008. While the NCSAM is still under development, the draft metrics and procedures were used to gain a general measurement of restored stream function. The stream sections adjacent to the Riverine Swamp and Bottomland Hardwood forests received a low quality score for the habitat function. These scores are characteristic of a site with low richness and diversity of benthic macroinvertebrates, lack of mature vegetation in the stream-side area and lack of in-stream habitat types. The drought conditions and age of the Site contributed to these reduced scores. However, these factors are expected to improve over time since the Site is protected in perpetuity. The NCWAM forms for Privateer Farms can be found at: http://www.ncdot.org/doh/preconstruct/pe/neu/Monitoring.

F. Proposed Credits

Based on the following ratios, the Privateer Farm Mitigation Bank is expected to generate the 415 credits of Riverine Wetland (402.5 acres restoration and 25 acres enhancement) and 34,005 credits of Stream (all restoration):

Stream Restoration -	1:1
Wetland Restoration -	1:1
Wetland Enhancement -	2:1

Of these credits, approximately 148.5 wetland credits and 25,939 stream credits have been debited from the Bank for various permitted projects prior to inclusion in the NCDOT UMBI. The remaining mitigation on the Site is 266.41 credits of Riverine Wetland and 8,066 credits of Stream. See Table 3 below for the Current Ledger for exact credit amounts debited and remaining.

Table 3 Current Ledger for Privateer Farm Site

Project Name River Basin 8-digit CU	Privateer Farms CAPE FEAR 03030005	Type of Credits and Amount of Debits Stream Restoration	Riparian Restoration	Riparian Enhancement
BEGINNING BALANCE		34,005	402.5	12.5
REMAINING BALANCE		8,066	254.0	12.41
DWQ Permit (Permittee)	**USACE Permit**			
MOU Credit Purchase (EEP)		40.00	3.60	
2004-1253 (NCDOT)	2002-00048	223.0	1.01	
2001-0404 (NCDOT)	1993-00570		17.30	
MOU Credit Purchase (EEP)			0.78	
(NCDOT)	2004-00136		0.004	0.01
(NCDOT)	2006-00358		0.01	0.02
(NCDOT)	2006-00360		0.03	0.06
Credit Transfer To NCDOT (U-2519/X-2)		25,676.00	23.86	
Credit Transfer To NCDOT (U-2519/X-2)			101.76	
MOU Credit Purchase (EEP)			0.07	

G. Credit Release Schedule

Wetland Credit Release Schedule

If deemed appropriate by the Interagency Review Team (IRT), 15% of a bank's total restoration credits shall be available for sale immediately upon completion of all of the following:

1. Execution of the mitigation banking instrument by the Sponsor, the Corps, and other agencies eligible for membership in the IRT who choose to execute the agreement;
2. Approval of the final mitigation plan;
3. Delivery of the financial assurances;
4. Recordation of the preservation mechanism, as well as a title opinion acceptable to the Corps covering the property;

Additionally, the NCDOT must complete the initial physical and biological improvements to each bank site pursuant to its mitigation plan no later than the first full year following initial debiting of the Umbrella Bank for the Bank Site.

Provided such physical and biological improvements are made in accordance with an approved mitigation plan, an additional 15% (total 30%) of the banks total credits shall be available for sale.

Subject to a bank sponsor's continued satisfactory completion of all required success criteria and monitoring, additional restoration mitigation credits will be available for sale by a bank sponsor on the following schedule:

- 10% after first year, if interim success measures are met (total 40%);
- 15% after second year, if interim success measures are met (total 55%);
- 20% after third year, if interim success measures are met (total 75%);
- 10% after fourth year, if interim success measures are met (total 85%); and
- 15% after fifth year, if Success Criteria are met (total 100%).

Stream Credit Release

The following credit release schedule applies only to those stream projects where Restoration or Enhancement I has been performed where pattern, dimension, and profile, or dimension and profile (respectively) have been improved.

If deemed appropriate by the IRT, 15% of a banks total stream credits shall be available for sale immediately upon completion of all of the following:

1. Execution of the mitigation banking instrument by the Sponsor, the Corps, and other agencies eligible for membership in the IRT who choose to execute the agreement;
2. Approval of the final mitigation plan;
3. Delivery of the financial assurances;
4. Recordation of the preservation mechanism, as well as the title opinion covering the property that is acceptable to the Corps.

Additional stream credits would be available according to the following release schedule:

- 15% upon completion of all physical and biological improvements made pursuant to the mitigation plan: (30% cumulative).
- 10% after first year, provided channel is stable and all other success criteria are met (40%);
- 10% after second year, provided channel is stable and all other success criteria are met (50%);
- 10% after third year, provided channel is stable and all other success criteria are met (60%);
- 10% after fourth year, provided channel is stable and all other success criteria are met (70%).

- 15% after fifth year, provided channel is stable and all other success criteria are met (85%).

A reserve of 15% of the banks total stream credits shall be released any time after 2 bank-full events have occurred, in separate years, provided the channel stable and all other success criteria are met. In the event that less than two bank-full events occur during the monitoring period, remaining credit release shall be at the discretion of the IRT.

H. Geographic Service Area

The Geographic Service Area (GSA) for the Site is portions of the Cape Fear River Basin delineated by the 8 digit hydrologic units 03030005 and 03030004, excluding the following 14 digit hydrologic units as illustrated by Figure 5:

03030004010010
03030004010020
03030004010030
03030004020010
03030004020020
03030004030010
03030004040010
03030004050010
03030004050030
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